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10/803,712	03/18/2004	Yee-Chia Yeo	TSM03-0760	7832
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SLATER & MATSIL, L.L.P. 17950 PRESTON ROAD, SUITE 1000 DALLAS, TX 75252				
			EXAMINER	
			RAYMOND, BRITTANY L	
			ART UNIT	PAPER NUMBER
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			05/02/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/803,712

Applicant(s)

YEO ET AL.

Examiner

Brittany Raymond

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 April 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-75 is/are pending in the application.
- 4a) Of the above claim(s) 1-37 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 38-75 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 3/18/2004; 8/30/2004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group II, Claims 38-75 in the reply filed on 4/10/2007 is acknowledged.
2. Claims 1-37 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 4/10/2007.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
4. Claims 38-62, 64-66, and 68-70 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 38-47 and 64-66, "a pH less than 7" is recited in claims 38 and 63 while the ranges recited in the dependent claims 39-43 and 64-66 recite a range of "x to 7." Claims 39-43 and 64-66 do not further limit the recitation of the independent claims making the claims indefinite. Since claims 44-47 are equivalent to claims 39-43 (as discussed below), these claims should be changed for the same reasons.

As to claims 51, 52, 69 and 70, the phrase "fluoride containing" should be changed to "fluorine containing."

Regarding claim 52, the recited format does not comply with accepted U.S. Patent practice with regard to the recitation of Markush grouping of claim elements.

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Phrases using "comprising" should recite elements in the alternative (i.e. "comprising A, B, C or D"), whereas closed sets ("consisting of") should recite elements as "selected from the group consisting of A, B, C and D." In the instant case, the phrase "consisting of" is used and should follow the format of a closed set of elements (See MPEP 2173.05 (h)).

As to claims 53-55 and 71, open-ended ranges are recited which make the claims indefinite.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 38-47, 57, and 61-66 are rejected under 35 U.S.C. 102(e) as being anticipated by Hirayama (U.S. Patent Publication 2006/0154188)

Hirayama ('188) discloses an immersion lithography method for forming resist patterns comprising: forming a photoresist film on a substrate, placing an immersion fluid on the resist film, exposing the resist film through the immersion fluid, and developing the resist film to form a pattern (Paragraphs 0179-0183), as recited in claims 38, 57, 61, and 63 of the present invention. Hirayama ('188) also discloses that a fluorine-based liquid is used as the immersion fluid (Paragraph 0180), which is known

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by one of ordinary skill in this art, to be acidic, or have a pH of less than 7, as recited in claim 38 of the present invention. Hirayama ('188) states that pure water or deionized water can be used as the immersion fluid (Paragraph 0008), as recited in claims 39 and 63 of the present invention. Although Hirayama ('188) does not state that the pH of the immersion fluid is 7, it is inherent that the pH of water is 7 and this falls in the ranges recited in claims 40-43 and 64-66 of the present invention. Also, it is known by one of ordinary skill in this art that pH is equal to $-\log [H^+]$, as shown by Brown (Chemistry: The Central Science). Thus, claims 44-47 are equal to claims 40-43, respectively, and are rejected for the same reasons. Hirayama ('188) discloses that the developing solution can be tetramethylammonium hydroxide (Paragraph 0226), as recited in claim 62 of the present invention. Hirayama ('188) also discloses that an excimer laser with a wavelength of 157 nm can be used in the process (Paragraph 0157), as recited in claim 63 of the present invention.

Hirayama ('188) teaches every limitation of claims 38-47, 57, and 61-66 and thus anticipates the claims.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
8. Claims 48-50, 67, and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirayama (U.S. Patent Publication 2006/0154188) in view of French (U.S. Patent Publication 2004/0175647).

The teachings of Hirayama ('188) have been discussed in paragraph 6 above. Hirayama ('188) teaches the recitation of dependent claim 50 of the present invention.

Hirayama ('188) fails to disclose that the optical surface can be silicon oxide or calcium fluoride.

French discloses that a compound lens can be made out of calcium fluoride or hydroxyl free silica, also known as silicon dioxide, when used in an immersion lithography process (Paragraphs 0190 and 0191), as recited in claims 48, 49, 67, and 68 of the present invention. It is known by one of ordinary skill in this art that silicon dioxide and silicon oxide have similar properties.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have used silicon oxide or calcium fluoride for the optical surface, as suggested by French, in the process of Hirayama ('188) because French teaches that this type of material does not react with the immersion liquid used and

works well with the type of exposure light used in the present invention.

9. Claims 56 and 72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirayama (U.S. Patent Publication 2006/0154188) in view of Hirayama (U.S. Patent Publication 2006/0154171).

The teachings of Hirayama ('188) have been discussed in paragraph 6 above.

Hirayama ('188) fails to disclose that a chemically amplified photoresist is used in the immersion lithography process.

Hirayama ('171) discloses a method of forming a resist pattern comprising application of a resist on a substrate, prebaking, exposure, post exposure baking, and developing (Paragraph 0057). Hirayama ('171) also discloses that an immersion lithography step can be added to the process (Paragraph 0060). Hirayama ('171) states that the photoresist used in the process can be made up of a resin that is used for chemically amplified resists (Paragraph 0067), as recited in claims 56 and 72 of the present invention.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have used a chemically amplified resist, as suggested by Hirayama ('171), in the process of Hirayama ('188) because Hirayama ('171) teaches that chemically amplified photoresists can work well in immersion lithography processes.

10. Claims 58-60 and 73-75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirayama (U.S. Patent Publication 2006/0154188) in view of Levinson (U.S. Patent 2005/0037269).

The teachings of Hirayama ('188) have been discussed in paragraph 6 above.

Hirayama ('188) fails to disclose that there is a stage underlying the semiconductor structure and that the stage and the semiconductor are immersed in the immersion fluid.

Levinson discloses an immersion lithography apparatus comprising a stage upon which the wafer to be patterned is mounted (Paragraph 0018), as recited in claims 59 and 74 of the present invention. Levinson also discloses in Figure 1 that the wafer region is immersed in the immersion fluid, as recited in claims 58 and 73 of the present invention. It would be obvious to immerse the stage underlying the wafer in the immersion fluid since the stage is part of the wafer region, as recited in claims 60 and 75 of the present invention.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have included a stage underneath the semiconductor wafer and immersed the stage and the semiconductor in the immersion fluid, as suggested by Levinson, in the process of Hirayama ('188) because Levinson teaches that a stage is needed to hold the semiconductor substrate and move it around in order to pattern the substrate, and immersing the whole stage and substrate allows for the pattern to be formed properly.

11. Claims 51-55 and 69-71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirayama (U.S. Patent Publication 2006/0154188) and French (U.S. Patent Publication 2004/0175647) as applied to claims 38-50, 57, and 61-68 above, and further in view of Letz (U.S. Patent Publication 2005/0186513).

The teachings of Hirayama ('188) and French have been discussed in paragraphs 6 and 8 above. Hirayama ('188) also discloses that a fluorine-based liquid can be used as the immersion fluid for the process (Paragraph 0042), as recited in claims 51 and 69 of the present invention.

Hirayama ('188) and French fail to disclose that a fluorine containing compound can be sodium, potassium or hydrogen fluoride, and that the concentration of the fluoride ions is greater than 0.01, 0.05, and 0.1 mol/L, as recited in claims 53-55 and 71 of the present invention.

Letz discloses a composition for an immersion lithography liquid comprising saturating a 4-valent element and carbon or silica, with a hydrogen and a halogen, said halogen chosen from fluoride, chloride and bromide (Paragraphs 0016 and 0017), which means hydrogen fluoride could be used, as recited in claims 52 and 70 of the present invention.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have used hydrogen fluoride, as suggested by Letz, in the immersion fluid in the processes of Hirayama ('188) and French because Letz teaches that using this compound allows for a more accurate exposure step of the immersion lithography process. It also would have been obvious, to have used the range of concentrations of fluoride ions recited in the claims 53-55 and 71 because this concentration determines the pH of the immersion fluid and can be determined by one of ordinary skill in the art without undue experimentation to form the fairly neutral to slightly acidic pH levels recited in claims 40-43 of the present invention.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brittany Raymond whose telephone number is 571-272-6545. The examiner can normally be reached on Monday through Friday, 8:00 a.m. - 4:30 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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PRIMARY EXAMINER